Instructional Materials Development (IMD)

Instructional Materials for Students

Dissemination and Implementation Sites

Assessment

Applied Research

Program Solicitation

NSF-02-067

DIRECTORATE FOR EDUCATION AND HUMAN RESOURCES
   DIVISION OF ELEMENTARY, SECONDARY, AND INFORMAL EDUCATION

PRELIMINARY PROPOSAL DUE DATES(S) (*required*)**: May 1, 2002**

FULL PROPOSAL DEADLINE(S) :

August 26, 2002 by 5:00 pm Local Time.

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SUMMARY OF PROGRAM REQUIREMENTS

GENERAL INFORMATION

Program Title: Instructional Materials Development (IMD)

Synopsis of Program:

The Instructional Materials Development (IMD) program includes four components:

- Instructional Materials for Students—supports the creation and substantial revision of comprehensive curricula and supplemental instructional materials that are research-based; enhance classroom instruction, preK-12; and reflect standards for science, mathematics, and technology education developed by national professional organizations.

- Dissemination and Implementation Sites—builds the capacity of the educational system to use research-based instructional materials and provides a range of services to interested schools, districts, and states that address issues related to awareness, selection, adoption, and implementation of these materials.

- Assessment—supports the creation of tools for assessing student learning that are tied to nationally developed standards and reflect the most current thinking on how students learn mathematics and science; projects can also focus on teacher assessment, assessment in informal settings, and assistance to schools and districts in implementing new assessments.

- Applied Research[1]—supports the research for development of Elementary, Secondary, and Informal Education (ESIE) programs, provides feedback for strengthening the portfolio, and identifies possible new directions in instructional materials, assessment, teacher education or informal programs.

Proposals may be submitted for projects in any field of science, technology, or mathematics (STM) typically supported by NSF.

[1] While Applied Research projects can address areas within all ESIE programs (Instructional Materials Development [IMD], Teacher Enhancement [TE], and Informal Science Education [ISE]), proposals to conduct applied research must be submitted to IMD.

Cognizant Program Officer(s):

For more information about IMD programs, please contact the following people in the Division of Elementary, Secondary, and Informal Education, telephone: (703) 292-8614

- Dr. John Bradley, Instructional Materials for Students [Mathematics], Dissemination and Implementation Sites [Mathematics], e-mail: jbradley@nsf.gov.

- Dr. Gerhard Salinger, Instructional Materials for Students [Physical Sciences and Technology Education], e-mail: gsalinge@nsf.gov.

- Dr. David Campbell, Instructional Materials for Students [Life and Earth Sciences], e-mail: dcampbel@nsf.gov.

- Dr. Janice Earle, Dissemination and Implementation Sites [Science], Assessment, and Applied Research, e-mail: jearle@nsf.gov.

Applicable Catalog of Federal Domestic Assistance (CFDA) Number(s):

- 47.076 --- Education and Human Resources

ELIGIBILITY INFORMATION

- **Organization Limit:** None

- **PI Eligibility Limit:** An individual may serve as the Principal Investigator (PI) for no more than one proposal per round of competition; any exceptions must obtain prior approval, in writing, from the IMD Section Head.

- **Limit on Number of Proposals:** None

AWARD INFORMATION

- **Anticipated Type of Award:** Standard or Continuing Grant

- **Estimated Number of Awards:** 10-15, including up to 4 Dissemination and Implementation Sites.

- **Anticipated Funding Amount:** Approximately $10 million, pending availability of funds.

PROPOSAL PREPARATION AND SUBMISSION INSTRUCTIONS

A. Proposal Preparation Instructions

- **Preliminary Proposals:** Submission of Preliminary Proposals is required. Please see the full program announcement/solicitation for further information.

- **Full Proposals:** Supplemental Preparation Guidelines

  - The program announcement/solicitation contains supplements to the standard Grant Proposal Guide (GPG) proposal preparation guidelines. Please see the full program announcement/solicitation for further information.

B. Budgetary Information

- **Cost Sharing Requirements:** Cost Sharing is Specialized. Please see the full program solicitation for further information.

- **Indirect Cost (F&A) Limitations:** Not Applicable.

- **Other Budgetary Limitations:** Other budgetary limitations apply. Please see the full program announcement/solicitation for further information.

C. Deadline/Target Dates

- **Letters of Intent (*optional*):** None

- **Preliminary Proposals (*required*):** May 1, 2002

- **Full Proposal Deadline Date(s):**

 August 26, 2002 by 5:00 pm Local Time.

D. FastLane Requirements

- **FastLane Submission:** Required

- **FastLane Contact(s):**

  - ESIE FastLane contact, telephone: (703) 292.8620, e-mail: ehr-esi-info@nsf.gov.

PROPOSAL REVIEW INFORMATION

- **Merit Review Criteria:** National Science Board approved criteria. Additional merit review considerations apply. Please see the full program announcement/solicitation for further information.

AWARD ADMINISTRATION INFORMATION

- **Award Conditions:** Standard NSF award conditions apply.

- **Reporting Requirements:** Additional reporting requirements apply. Please see the full program announcement/solicitation for further information.

I. INTRODUCTION

A. THE DIVISION OF ELEMENTARY, SECONDARY, AND INFORMAL EDUCATION

<u>Goals and Objectives</u>. Science, technology, and mathematics (STM) education, pre-Kindergarten through grade 12 (preK-12), lays the foundation of knowledge and skills needed by future researchers, educators, and technologists; students pursuing post-secondary education in other disciplines; and individuals directly entering the technological workforce. The Division of Elementary, Secondary, and Informal Education (ESIE) supports the National Science Foundation's mission of providing leadership and promoting development of the infrastructure and resources needed to improve preK-12 STM education throughout the United States.

ESIE's comprehensive and coherent, research-based program portfolio develops the nation's capacity to support high-quality STM education. Innovative instructional materials and student assessments, as well as new models for the delivery of teacher professional development contribute to STM classroom environments that enable all students to achieve their full potential. Moreover, ESIE's informal learning opportunities via media, exhibit, and community-based programs increase scientific and technological literacy, as well as develop life-long learning skills that benefit students of all ages. All ESIE programs contribute to development of a knowledge base that informs practice and of partnerships that leverage expertise and other resources of major education stakeholders nationwide, including higher education, state and local education agencies, school districts, informal science education institutions, and industry.

<u>Program Overviews</u>. Programs administered by ESIE in FY 2002 include:

- ***Instructional Materials Development (IMD)*** -- IMD develops high-quality, research-based instructional and assessment materials for students that enhance knowledge, thinking skills, and problem-solving abilities of all students, as well as incorporate recent advances in disciplinary content, research on teaching and learning, and instructional technologies. IMD materials are intended to be implemented nationwide and address learning in diverse settings.

- ***Teacher Enhancement (TE)*** – TE develops models for strengthening skills of the teacher workforce by expanding and deepening their understanding of content, pedagogy, and instructional technologies; by heightening awareness and deepening understanding of the diverse learning needs of students; by grounding continued professional development in the context of school structure and organization; and by developing a cadre of teachers and administrators who can effectively lead the reform of STM education.

- ***Centers for Learning and Teaching (CLT)*** – CLT focuses on the advanced preparation and professional development of STM practitioners and educators, as well as establishment of complex, meaningful partnerships among education stakeholders, especially Ph.D.-granting institutions, school systems, and informal education performers. Its goals are to rebuild and diversify the national infrastructure for STM education; to increase the number of K-16 educators capable of delivering high-quality content, instruction, and assessment; and to provide substantive research opportunities into the nature of learning, teaching strategies, as well as education reform policies and outcomes.

- ***Presidential Awards for Excellence in Mathematics and Science Teaching (PAEMST)*** – PAEMST, administered on behalf of the White House, recognizes exemplary careers of elementary and secondary teachers of mathematics and science.

- *Informal Science Education (ISE)* – ISE provides stimulating experiences for STM learning outside of formal classroom environments through media, exhibits, and community-based programming. Its goals are to increase understanding of, and participation in, STM disciplines by individuals of all ages; to establish linkages between informal and formal education; and to stimulate parents and others to support their children's STM learning endeavors and to become informed proponents for high-quality, universally available STM education.

- *Advanced Technological Education (ATE)* – Jointly managed by the Division of Undergraduate Education (DUE) and ESIE, ATE promotes improvement in technological education at the undergraduate and secondary school levels by supporting curriculum development; preparation and professional development of college faculty and secondary school teachers; internships and field experiences for faculty, teachers, and students; and other activities. With an emphasis on two-year colleges, the program focuses on the education of technicians for the high-technology fields that drive our nation's economy.

ESIE has identified three issues that should be integrated, as appropriate, into funded projects across its programs.

- *Evaluation* – ESIE has a strong commitment to evaluation that assesses the effectiveness and impact of its projects in enhancing learning and instruction in STM disciplines in both formal and informal education settings. All projects should be based upon the research in cognitive science.

- *Instructional Technology* – Projects should capitalize on educational technologies and electronic networking in the development of materials, instructional strategies and professional development in a manner that uses the technology thoughtfully and ensures accessibility to a quality education for all students.

- *Promoting Representation in STM Education and Careers* – All ESIE programs have the goal of increasing access, participation, and success of women, underrepresented minorities, and persons with disabilities in STM education. ESIE is particularly interested in increasing the numbers of such students who will pursue advanced study and careers in STM areas, including the teaching of science, technology, and mathematics, grades K-12.

ESIE programs, other than IMD, are described in separate program announcements. Updates may be issued, as needed, to announce relevant changes or additions. To stay current with ESIE program offerings, periodically visit the ESIE Web Site, http://www.ehr.nsf.gov/ehr/esie/; for ATE, the DUE Web Site, http://www.ehr.nsf.gov/ehr/due/. All NSF publications referenced in this document are available via the NSF Online Document System, http://www.nsf.gov/cgi-bin/pubsys/browser/odbrowse.pl.

B. INSTRUCTIONAL MATERIALS DEVELOPMENT (IMD)

OVERVIEW OF IMD COMPONENTS

The goal of the IMD program is to enhance science, technology, and mathematics (STM) content knowledge, as well as the thinking skills and problem solving abilities, of all students, pre-Kindergarten through grade 12 (preK-12), regardless of background, ability, or future education plans. The IMD program encourages learning by all students by promoting positive dispositions toward science and technology and of themselves as learners. A broader cross section of students is led to pursue education in scientific and technological disciplines through the use of real-world contexts and by providing an understanding of the role of science and technology in the workplace. These goals are implemented through support of the development, revision, evaluation, and dissemination of materials and assessments that guide instructional decisions and provide information on depth of student learning of concepts and ideas. In pursuing enhanced student learning of STM content with depth and understanding, IMD recognizes the need to align teacher content knowledge and pedagogical strategies with these materials and assessments. IMD promotes applied research that increases understanding of how teachers, materials, and assessments support student learning. The IMD program also supports awareness and use of materials and assessments in interested school districts, and supports the dissemination of information for administrators, parents and other caregivers to promote the adoption and enhance the effectiveness of the implementation of research-based classroom-tested instructional materials.

The major emphasis of the IMD program is the development, dissemination, and implementation of instructional materials and assessments in science, technology education,[2] and mathematics. Attention is called to two additional areas that merit investigation.

- **Impact Assessments**. Proposals are encouraged for studies of the effectiveness and impact of instructional materials developed with NSF support. Effectiveness and impact may include such things as student achievement, persistence in course taking beyond school and state requirements, and documentation of increased interest in science and technology disciplines. Research could range from meta-analyses of existing studies, to large-scale studies involving the design and administration of new evaluation tools, which could include the use of non-traditional measures (examples include indirect measures, embedded data collection, usage patterns, etc.). The studies should be conducted by external investigators who are not connected with the individual materials development projects. Investigators contemplating such studies should discuss their ideas with an IMD Program Officer prior to writing a preliminary proposal.

- **Emerging Technologies**. IMD also seeks to support a small number of innovative, high-risk projects that develop and test prototypes of instructional materials using state-of-the-art technologies such as hybrid course materials that combine text with dynamic elements, assessment tools embedded in student materials that provide timely feedback, adaptive and flexible guides that provide support for teaching, and others. Proposals for such high-risk projects must demonstrate promise for advancing and testing the limits of instructional and assessment materials to promote student understanding of STM concepts and processes. Typically, the funding is limited yet sufficient to test the efficacy of the innovation. Proposals to be considered for this category should be clearly defined as such in the project summary.

[2] Technology education refers to the study of the human-made environment using the design process that leads to the development of technological literacy. It is separate from uses of instructional technology.

II. PROGRAM DESCRIPTION

Instructional Materials Development Program Components

There are four components in the IMD program. These are **Instructional Materials for Students**, **Dissemination and Implementation Sites**, **Assessment**, and **Applied Research**.

A. Instructional Materials for Students

PROJECT CHARACTERISTICS

Proposed instructional materials must exhibit a coherent content framework that is aligned with standards developed by national professional organizations (American Association for the Advancement of Science, 1993; International Technology Education Association, 2000; National Research Council, 1996; National Council of Teachers of Mathematics, 2000); foster inquiry, including critical thinking, problem solving, decision-making, and communication at increasing levels of complexity; and focus on appropriate and important topics at each grade level. Projects should be grounded in recent research on teaching and learning (e.g., Bransford, Brown, & Cocking, 1999; Wiggins & McTighe, 1998) and further an understanding of the connections among science, technology, engineering, and mathematics disciplines. Projects should be planned and implemented by teams consisting of appropriate combinations of practicing scientists, mathematicians, and engineers, STM educators, classroom teachers, professional curriculum developers, assessment experts, and instructional technology experts. Projects should include research to understand better the effectiveness of the materials in increasing student learning and changing teacher practice.

Projects are supported that are national in scope and significance. These projects should have the potential to enhance student learning and make a significant and noticeable impact on the national market for instructional materials. Projects range from the creation of new materials to the substantial revision of effective materials; from development of comprehensive curricula for several school years to the development of a single module for one grade level; and from the integration of several disciplines to addressing a single topic.

Particularly encouraged are projects that develop and implement research-based instructional materials that ameliorate achievement gaps between students and lead to improved understanding of and participation in STM by members of underrepresented groups. Strategies for ensuring equity and accessibility in materials use and in student learning should be part of the development and implementation process. Proposals should describe specific research-based strategies for engaging target groups.

Incorporation of instructional technologies should be considered, especially when those technologies are used to provide learning experiences that enhance student understanding. Digital libraries, computational tools, mo deling and visualization, virtual environments, connectivity, and communication are among a growing catalog of capabilities that change what and how students can learn. All IMD-funded projects should use instructional technology in appropriate ways, anticipating a future where these technologies are used widely to enhance education.

Also supported are innovative, high-risk projects that develop and test prototypes of instructional materials and instructional technologies. Proposals for such high-risk projects must demonstrate promise for advancing the state-of-the-art development of curriculum and assessment materials and for testing the limits of instructional and assessment materials to promote student understanding of science, mathematics, and/or technology concepts and processes.

In addition, when appropriate, the projects should include products designed to help parents understand, and teachers implement, the materials. It is important that projects include strategies and tools to assess the impact of the instructional materials, particularly on student learning. These data should be presented in ways that help stakeholders, including teachers, administrators, and parents, make informed decisions about curriculum adoptions.

PROJECT DESCRIPTION

Exemplary projects will contain the following elements, which should be addressed in the Project Description section of the proposal. Proposal reviewers will examine the extent to which these elements are effectively incorporated in the overall project plan.

- *Goals and Objectives*. Describe the major goals for the project, as well as the anticipated outcomes, for the students and for the teachers.

- *Project Evaluation.* Describe the evidence that will be accepted to determine the extent to which goals are achieved, and the evaluation strategies that will be used to obtain that evidence. Each major aspect of the project should be evaluated -- the development process, fidelity of implementation, student learning, teacher professional development, etc. Formative evaluation, designed to effect development efforts, could be conducted by an internal evaluator. External evaluation should provide evidence of the effectiveness of the developed projects. The proposal should provide evidence of the qualifications of the evaluators.

- *Anticipated Products*. Describe the materials to be produced (e.g., workbooks, textbooks, software, videos, CD-ROMs, scholarly publications, monographs), including the specific learning activities to be developed (experiments, student projects, assessments, etc.).

- *Rationale.* Describe how the proposed materials will address learning goals for students and teachers throughout the nation better than existing materials. Relevant literature should be referenced to indicate knowledge of disciplinary and pedagogical issues. The proposer should describe how the instructional materials build on, and relate to, previous and on-going efforts in the field. A search of the Eisenhower National Clearinghouse (ENC) database is recommended (see: http://enc.org/partners/fed/mfinder/nsf.htm).

Proposals for the substantial revision of successful IMD-funded materials must provide data on classroom use of the earlier materials. Data such as market share, total number of copies sold or in use, or other pertinent measures, should be cited. Evidence of positive student outcomes, in terms of student achievement, persistence in course taking beyond school, district, or state requirements, and/or other measures must be provided. Portions of the materials to be revised (e.g. units, modules, etc.) must be identified and a description of the nature of the changes must be given. Proposals must provide a clear rationale for the changes being proposed, based on research/studies of the implementation of the materials to be revised. Finally, evidence of strong support of the publisher, including substantial financial contributions to the revision process, must be included.

- *Work Plan*. Explain how the materials will be created, reviewed, pilot-tested, field-tested, evaluated, and published. A detailed plan, including a complete timeline that indicates who is responsible for each facet, helps reviewers understand the flow of work. Draft materials must be pilot-tested with master teachers, and field-tests must include a broad range of teachers with diverse backgrounds. It is expected that results of these trials will be used to inform revisions of the materials, and that both the results of the trials and the revisions will be submitted to NSF.

- *Content and Pedagogical Strategies*. Describe how the materials' content and pedagogical strategies are aligned with national standards; how the materials will prepare and motivate students to continue to study STM at higher grade levels; and how the materials will account for potential differences in students' prior knowledge. Resources (e.g., computer expertise) that will be needed at the school level for implementation of the materials also must be specified. If the materials are supplemental in nature, they must have a clear and limited content focus; utilize appropriate scientific, computational, and instructional technologies; and demonstrate connections to comprehensive curricula. All materials should undergo independent review to ensure accuracy of the content, appropriateness of the pedagogy, and suitability of the contexts, language, etc., for the intended audience. For materials that span one or more years of instruction, the review will be conducted by reviewers external to the project who are selected in consultation with the cognizant Program Officer at NSF.

- *Assessment.* Describe tools and strategies for student assessment that will be included in the instructional materials. It is critical that student assessments be clearly aligned with the desired student learning outcomes and be informed by the nationally-developed standards in mathematics, science, and/or technology. Assessments should address both formative and summative aspects of learning. That is, assessments should include strategies for teachers to use during instruction as a guide for making instructional decisions as well as to determine what students are learning. Development and validation of assessment tools should occur in both the pilot- and field-testing of the materials. To the extent possible, there should be a variety of assessment strategies that are responsive to the different ways that students communicate understanding of content.

- *Professional Development*. Describe the products to be developed (e.g., print, CD-ROM, web-based) that will support teachers and administrators in accurately and effectively implementing the materials. This element should include teaching guides to accompany the student materials, but may also include other products. If the materials span one or more years of instruction, there must be separate professional development materials to help teachers develop a deep understanding about the content and pedagogy of the materials. There should be plans for sustaining the use of the professional development materials after the end of the project and for informing teacher educators about the new materials to facilitate incorporation into pre-service teacher education programs. The creation of the professional development materials must meet the guidelines for Teacher Enhancement (TE) program's professional development materials (see NSF 01-60).

- *Community Involvement*. Describe ways to communicate to the community how the materials are designed to enhance learning of significant subject matter content and to increase student interest in science, mathematics, and technology. Attention should be given to communicating how the materials may differ from those with which community members may be familiar. Further, parent/community materials should assist parents and caregivers in helping their children in STM education.

- *Dissemination and Implementation*. Explain how information about the materials will be shared with professionals in STM education communities both during and after the project. Instructional materials typically will be published and distributed commercially, although in a few instances "free" distribution (e.g., through a refereed and highly visible Web Site) might be an appropriate outlet. Proposals should provide a timeline for securing a publisher (or identifying another distribution outlet). This step typically should occur within the first two years of multi-year projects, with distribution outlets firmly established (e.g., through a contract with a publisher or distributor) by the end of the third year of the project. Dissemination plans that project potential sales income during the duration of the grant should specify how that income will be used to support the implementation, revision, or continued development of materials.

- *Personnel*. Describe the expertise and experience of the key personnel. It is expected that the development team will include, as appropriate, scientists, mathematicians, and engineers; STM educators; classroom teachers; assessment and evaluation experts; technology experts; instructional technologists; and professional developers. The proposal should include a detailed description of the role and commitment level of each of the key personnel.

- *Results of Prior NSF Support*. Describe results of prior NSF support for educational projects in which senior personnel have been involved. For projects that have developed materials related to the proposed work, the proposal must include a summary of the past project evaluation that provides compelling evidence of the quality and effectiveness of the materials developed.

B. Dissemination and Implementation Sites

PROJECT CHARACTERISTICS

Dissemination and Implementation Sites increase access to the use of high-quality instructional materials and thus increase the opportunities for all students to learn mathematics, science, and technology. There is a growing body of evidence that curriculum implementation is an effective strategy for districts and schools to use in launching a standards-based reform effort (Berns, Kantrov, Pasquale, Makang, Zubrowski, & Goldsmith, 2000; Cohen & Hill, 1998; Weiss, Arnold, Banilower, & Soar, 2000; Weiss, Knapp, Hollweg, & Burrill, 2001; Winkler & Mark, 2001). The primary goal of Dissemination and Implementation Sites is to increase the expertise of state, district, and school level educators to select, adopt, and implement high quality instructional materials. Dissemination and Implementation projects are designed to leverage the investment made in instructional materials development in interested schools and districts.

Key elements of Dissemination and Implementation Sites are: (a) knowledge transfer (diffusing knowledge broadly), (b) systems change (working with districts and schools to improve practice in mathematics and science), (c) expert consultation (acting as "brokers" and linking districts and schools with others), and (d) integration (providing support to districts and schools so that new materials are integrated into the system).

Based on these key elements, each Dissemination and Implementation Site is expected to:

- Build awareness of research-based instructional materials. Each site will become the primary national resource for information and expertise on curriculum materials selection and implementation for a particular subject area and grade band. This includes providing opportunities for educators to examine instructional materials and to see them in action in selected schools. Information should be made widely available through web pages and print material and should include evaluative data when they are available. Collectively, these sites provide an ongoing support system for integrating and promoting research-based practices.

- Maintain strong connections with curriculum developers of the materials that are being disseminated. This ensures better fidelity of implementation (expert consultation).

- Enhance local curricular leadership (school boards, superintendents, curriculum specialists in mathematics, science, and technology, teachers and parents) to sustain an ongoing process of curriculum improvement. This can include strategic planning, building effective partnerships to support school change, and planning for professional development that helps teachers in the use of the materials (systems change).

- Connect districts and schools with related projects and resources from other NSF programs that can specifically help them implement new curricula. These include the Math and Science Partnership, Local Systemic Change, Centers for Learning and Teaching, new instructional materials development, and applied research projects (expert consultation).

- Connect districts and schools with recent research on curriculum implementation, including student outcome data (expert consultation).

- Identify gaps in the research base around curriculum implementation and student learning, and propose projects to address those gaps (systems change, integration).

- Provide connections with other national curriculum development efforts such as those initiated by professional organizations, publishers, mathematicians and scientists, and innovative preservice programs (expert consultation).

- Work collaboratively and synergistically with other dissemination and implementation projects. Those contemplating the preparation of proposals for a Support Site should consult the ESIE web page, http://www.ehr.nsf.gov/ehr/esie/.

- Assist a limited number of strategically chosen local districts and schools ready to undergo the curriculum implementation process to gain a deeper knowledge base about the implementation process (expert consultation and integration).

- Provide feedback about the implementation process in schools, including approaches to instructional materials and professional development.

- Support contacts among school districts, so that schools can learn from each other. These Sites should support the sharing of models of successful practice among schools.

Two lessons have been learned from the first set of Dissemination and Implementation Site projects (Tushnet, et al., 2000). First, Sites should focus on either mathematics or science. Second, Sites appear to be more successful when they focus on a particular grade band (elementary, middle grades, high school). There are characteristics that differ between curriculum, instruction, and pedagogy at different levels of schooling. School organization at the different levels means that different strategic approaches to implementation also come into play. For information on existing Sites, see the ESIE web page, http://www.ehr.nsf.gov/ehr/esie/.

PROJECT DESCRIPTION

Exemplary projects will contain the following elements, which should be addressed in the Project Description section of the proposal. Proposal reviewers will examine the extent to which these elements are effectively incorporated in the overall project plan.

- *Goals and Objectives*. Provide goals that clearly address the Dissemination and Implementation Site's purpose. Identify the disciplinary and grade-level band focus of the proposed site.

- *Project Evaluation*. Describe the Site evaluation plan and the criteria that will be used to judge the success of the site. External evaluation data are required of all supported activities to provide formative and summative information on the quality of the partnerships developed, effectiveness of the approach, and impact of the site. External evaluation data must also be collected in districts where sites work intensively, and should examine changes in teachers' knowledge, in the quality of instruction, and in student achievement. In addition, Sites will be required to participate in an evaluation of the entire portfolio of projects.

- *Rationale and Anticipated Outcomes.* Provide a justification for the site's organization, approaches, and products. In addition, a description must be provided ensuring that all selected materials to be disseminated by the site are based on accepted standards, are research-based, and pilot- and field-tested. Instructional materials that are supported by the site should be sensitive to issues of gender, race, class, ethnicity, and cultural differences. It is anticipated that the curricula disseminated will change over time, as evidence is generated about their effectiveness or as new materials are developed.

- *Work Plan.* Describe how the Site will operate. For example, some sites may choose to work through a regional structure with satellites distributed throughout the country. Site personnel should be aware of regional differences in needs for instructional materials and have access to on-line conferencing or video-conferencing to assist remote school districts. All Sites must form working relationships with institutions of higher education, school districts, curriculum developers, publishers, other dissemination and implementation projects, and major national reform initiatives. The lead institution should provide evidence that it is "neutral" with regard to the curricula it intends to disseminate and recommend for adoption/implementation.

- *Dissemination.* Describe the plan for dissemination of the Site's products, such as awareness and planning materials, professional development materials, results of research, etc.

- *Personnel.* Describe the expertise and experience of key personnel. It is expected that key personnel will include mathematics and/or science educators with experience in curriculum dissemination and implementation, professional development experts, and university faculty.

In addition to Dissemination and Implementation Sites that focus on grade levels, there is a need for **K-12 Support Sites.** A K-12 Support Site is intended to ensure that there is reasonable articulation across the Dissemination and Implementation Sites and to provide the field with one place to go for information in either mathematics or science. Functions of a Support Site include: (a) providing information (through brochures and Web Sites) to interested participants about the work of the Dissemination and Implementation Sites; (b) helping districts or schools to focus on articulation issues across grade levels; (c) providing regular opportunities for the site PIs to meet around issues of common concern; (d) developing technical assistance materials for the sites to use in common; (e) providing assistance around general issues such as strategic planning, building partnerships, and working with the community; (f) providing information on adoption opportunities and constraints in schools and districts; (g) providing expertise on working with schools; and (h) acting as a repository of information on current research around curriculum implementation including student outcomes.

It is anticipated that one or two Support Sites (one that supports both mathematics and science, or one that supports mathematics and one that supports science) will be active at all times. Support Sites need to ensure collaboration with the existing Dissemination and Implementation Sites and provide coherence to the overall effort. Those proposing a separate site for either mathematics or science should pay particular attention to the issue of coherence. In either case, it is strongly advised that prospective Principal Investigators communicate with a Program Officer before preparing a preliminary proposal, and provide a strong rationale for the option selected.

The *Project Description* section of proposals for Support Sites should include the bulleted items listed for the Project Description for Dissemination and Implementation Sites, with appropriate modifications. In particular, items (a)-(h) cited in the paragraph above should be addressed and the work plan should describe how the proposed support site will work collaboratively and synergistically with the Dissemination and Implementation Sites and provide for a coherent effort.

C. ASSESSMENT

PROJECT CHARACTERISTICS

Accurate assessment of student learning is critical for determining the effects of education reforms. New assessment tools must be developed that are tied to accepted standards, as well as to specific reform goals. Similarly, schools and districts need support for new types of assessment; for documenting the quality of new instructional materials; for assessing teacher knowledge and practice; and for assessing learning in informal settings. IMD encourages the development and implementation of new directions in assessing student and teacher learning in both formal and informal settings (see ESIE Program Solicitation [NSF 01-60] for description of the Teacher Enhancement [TE] and the Informal Science Education [ISE] programs). Assessments may range from those embedded in instructional materials to the creation of items for general use by districts and states.

Assessment projects: (1) are based on current research and include a model of cognition and learning as the cornerstone of the assessment design process (Pellegrino, Chudowski, & Glaser, 2001); (2) provide reliable and valid information that leads to a better understanding of how student learning can be enhanced and how instructional practice can be improved; (3) are developed in collaborative teams with appropriate expertise in the content area, in cognitive and learning theory, in assessment development and psychometrics, and that include target users (e.g., teachers); and (4) are regional or national in scope.

Assessment projects should address one or more of the following areas:

Assessment Development

- **Student Learning.** Assessment that focuses on measuring student learning and achievement. Assessment development that focuses on comprehensive tests is needed. These tests should be consistent with standards developed by national professional organizations, and be cost effective and easy to administer, score, and interpret. Critical areas of need include: (a) assessment instruments that focus on NSF-funded materials and key concepts or strands in middle grades mathematics; (b) projects that develop various tools to assess and guide student learning and instruction (e.g., embedded assessments); (c) comprehensive science (e.g., middle school science); and (d) technology education assessments (e.g., concept acquisition through project-based learning).

- **Teacher Knowledge and Performance**. New and effective approaches to assess teachers' knowledge and performance aligned with effective instructional strategies.

- **Informal Education**. Assessment instruments that examine learning in informal settings, such as museum exhibits, television, and films. Projects should consider connections with classroom assessment efforts in terms of both content and psychometric approaches.

- **Technology-Based**. Effective applications of technologies for assessment purposes. Studies examining unique contributions of various technologies to assessment are encouraged.

Assessment Assistance

- **Technical Assistance.** New approaches are needed to provide assistance to schools and districts in judging, adapting, and implementing available assessment tasks/tests and in using the information they provide.

- **Communication Assistance**. Materials and strategies may be developed to help schools and districts communicate effectively with teachers, administrators, school board members, parents, and the general community about the role of assessment. Materials and strategies that help public to be critical consumers of available assessments and assessment results are also welcome.

PROJECT DESCRIPTION

Exemplary projects will contain the elements listed below, which should be addressed in the Project Description section of the proposal. Proposal reviewers will examine the extent to which these elements are effectively incorporated in the overall project plan.

- *Goals and Objectives*. Provide a description of the major goals for the project and for targeted audiences (e.g., students, teachers, general public).

- *Project Evaluation.* Describe the evidence that will be accepted to determine the extent to which the goals are achieved and the activities that will be used to obtain that evidence. An advisory board or external review team with expertise in the content area, STM education, assessment development, and measurement is recommended to oversee the project. The proposal should provide evidence of the qualifications of the advisory board or review team members.

- *Anticipated Products*. Describe the assessment materials to be produced (e.g., type of assessments, monographs for helping teachers to implement assessments).

- *Rationale.* Provide evidence that the proposed assessment materials meet the needs of students and teachers better than the existing ones. The project should be based on clear theoretical foundations and include a thorough overview of relevant research and literature to indicate knowledge of disciplinary, learning, cognition, and assessment issues. The proposal *must* describe how the assessment materials build on and relate to previous and on-going efforts in the field, and the contribution they will make to the field of assessment. A search of the Eisenhower National Clearinghouse (ENC) database is recommended(see: http://enc.org/partners/fed/mfinder/nsf.htm).

9

- ***Work Plan***. Explain how the assessments or materials will be created, reviewed, pilot-tested, field-tested, evaluated, and disseminated. The use of appropriate assessment development methodologies and psychometrically sound evaluations is expected. The proposal should contain a detailed plan of work, including a complete timeline.

- ***Dissemination***. Explain how information about the assessments and materials will be shared with professionals in SMT education communities both during and after the project. A dissemination plan that projects potential sales income should specify how that income will be used to support the implementation, revision, or continued development of assessment materials.

- ***Personnel***. Describe the expertise and experience of the key personnel. It is expected that the assessment development team will include, as appropriate, scientists, mathematicians, and experts in technology; STM educators; classroom teachers; curriculum developers; and assessment and psychometric-experts. The proposal should include a detailed description of the role and commitment level of each of the key personnel.

- ***Results of Prior NSF Support***. Describe results of prior NSF support for educational projects in which senior personnel have been involved. Proposers who have developed assessments and materials related to the proposed work should include a summary of the past project evaluation that provides compelling evidence of the quality and effectiveness of the materials developed.

D. APPLIED RESEARCH

PROJECT CHARACTERISTICS

ESIE has a strong commitment to applied research that assesses the effectiveness and impact of funded efforts in enhancing learning and instruction in STM in both formal and informal educational settings. The purpose of applied research projects is to ensure that all ESIE programs are firmly grounded in research and that ESIE projects benefit from this knowledge. Applied research provides important feedback for strengthening ESIE's portfolio and for identifying new programmatic directions. Research studies may be of three different types:

- separate applied research efforts that grow out of completed projects or from questions that arise through analysis of an issue of priority to ESIE;

- well-defined elements of a proposed IMD, ISE, or TE project; or

- supplements to an existing project to address questions that have arisen during project implementation. In these cases, proposed studies must generate important feedback to the on-going project.

Examples of questions that might be addressed include: In what ways and under what circumstances is enhanced student learning an outcome of using NSF-funded instructional materials? Do NSF-funded instructional materials enhance other desirable student outcomes (e.g., increased enrollments in upper level STM courses)? What characteristics of teachers and classroom environments lead to student achievement gains? What elements (e.g., time, reflection, activities) are needed in programs that educate new and experienced teachers to implement instructional materials with fidelity in classrooms and increase student learning? What characteristics of professional learning communities of teachers help to sustain reform? What learning outcomes result from the use of instructional technologies? How does informal learning promote better understanding of concepts, processes, and thinking in scientific and technical disciplines for learners of all ages?

PROJECT DESCRIPTION

Exemplary projects will contain the following elements listed below, which should be addressed in the Project Description section of the proposal. Proposal reviewers will examine the extent to which these elements are effectively incorporated in the overall project plan.

- ***Goals and Objectives***. Provide clear research questions that address areas of interest fundamental to ESIE's mission and goals.

- ***Project Evaluation.*** Describe the evidence that will be accepted to determine the extent to which the goals are achieved and the activities that will be used to obtain that evidence. An advisory board or external review team with expertise in the content area, STM education, methodology (qualitative or quantitative), and measurement is recommended to oversee the project. The proposal should provide evidence of the qualifications of the advisory board or review team members.

- ***Anticipated Products***. Describe the materials to be produced (e.g., workbooks, software, assessment tools, scholarly publications, monographs, etc.).

- ***Rationale.*** Provide evidence that the project is based on clear theoretical foundations, and include a thorough overview of relevant research and literature to indicate knowledge of disciplinary, pedagogical, and evaluation issues. The proposal *must* describe how the research endeavor builds on, and relates to, previous and on-going efforts in the field. The proposal must provide evidence that the research project has a high likelihood of generating data that will contribute to the cycle of design, research, and redesign of ESIE's programs and project portfolios. A search of the Eisenhower National Clearinghouse (ENC) database is recommended (see: http://enc.org/partners/fed/mfinder/nsf.htm).

- ***Work Plan***. Explain clearly the research plan and the methodology to be applied. Explain how the research plan will provide answers to the research questions. Issues related to internal validity (correctly concluding about the effects of treatment) and external validity (can the research findings be generalized) of the data generated should be considered. An explanation of how data will be collected and analyzed and the appropriateness of the methods used should be included.

- ***Dissemination***. Explain how research results will be shared with professionals in STM education communities both during and after the project.

- ***Personnel***. Describe the expertise and experience of key personnel. The proposal should include a detailed description of the role and commitment level of each of the key personnel.

- ***Results of prior NSF support***. Describe results of prior NSF support for educational projects in which senior personnel have been involved. In cases where previous projects have resulted in materials related to the proposed work, include a summary of the past project evaluation that provides compelling evidence of the quality and effectiveness of the materials developed.

Principal Investigators interested in supplementing a current project with a related applied research effort should contact their cognizant NSF Program Officer. Approximately $1.5 million will be available for separate projects in fiscal year 2003. Stand-alone proposals will be reviewed in collaboration with the EHR Division of Research, Evaluation and Communication (REC). ESIE will not accept proposals under current consideration for funding by REC.

E. REFERENCES

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Weiss, I.R., Knapp, M.S., Hollweg, K., & Burrill, G. (Eds.). (2001). *Investigating the influence of standards. Washington, DC:* National Academy Press.

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Winkler, K., & Mark, J. (Eds.). (2001). *Perspectives on curricular change: Interviews with teachers, administrators, and curriculum developers*. Newton, MA: Education Development Center, Inc.

III. ELIGIBILITY INFORMATION

The categories of proposers identified in the Grant Proposal Guide are eligible to submit proposals under this program announcement/solicitation.

IV. AWARD INFORMATION

Duration and Funding Level. For Instructional Materials for Students, Assessment, and Applied Research, project duration is expected to be from 2 - 5 years. The level of funding for grants for Instructional Materials for Students depends upon the scope of the project. Amounts range from up to $300,000 for the development of a module to several million dollars for development of a single year of comprehensive materials. For Dissemination and Implementation Sites, the funding level may be up to $1,750,000 per year for a maximum of five years. Funding for a Support Site for a single discipline may be up to $1,400,000 per year and funding for a Support Site for mathematics and science may be up to $2,000,000 per year. In either case funding can be for up to five years. For Assessment projects, the maximum total request of any project may not exceed $1 million per year. For Applied Research, projects will normally be funded at less than $500,000 per year.

V. PROPOSAL PREPARATION AND SUBMISSION INSTRUCTIONS

A. Proposal Preparation Instructions

Preliminary Proposals:

All components of the IMD program listed in this solicitation require a preliminary proposal for submission of a full proposal unless the proposal was declined by ESIE in the previous year's proposal review. Preliminary proposals must be submitted via FastLane no later than 5:00 PM local time on the specified deadline. Submission of preliminary proposals via FastLane requires completion of the following FastLane forms:

Cover Sheet. Be sure to check the preliminary proposal box.

Project Summary. The abstract should be no longer than 150 words and describe the disciplinary content, the grade level of the audience for the project, the pedagogical strategies to be used, and the IMD component under which the proposal is to be considered. The abstract is used to assign proposals to reviewers.

Project Description. This section is limited to six pages. The project narrative should address the following topics: (a) relevant research, (b) need for the project, (c) goals or objectives of the project, (d) evidence to be accepted to demonstrate the extent to which the project achieves its goals, (e) essential features of the project and a workplan that describes how the project will be accomplished, (f) evaluation plans (both formative to inform project development and summative to assess the effectiveness of the project with the target audience), and (g) dissemination plans. Page formats should be single-spaced with a clear and legible type size of no smaller than 12-point type and with no less than 2.5 cm margins on all sides.

Budgets. Preliminary proposals should provide an estimated budget for the total amount of money being requested from NSF with information on salaries, equipment (where allowable), participant costs, consultant costs, travel, indirect costs, and cost-share from other sources, including any partners and their contribution. The budget should be entered as the Year 1 budget in FastLane; FastLane automatically creates the cumulative budget. A one-page narrative budget explanation should be included in the Budget Justification section.

Biographical Sketches. Preliminary proposals should provide a brief narrative description of the expertise relevant to the proposed project of key personnel (e.g., educators, researchers, and evaluators) to be involved. Biographical sketches should be complete enough to show that the expertise necessary to conduct the project is available.

Supplementary Documents: Appendices and letters of support are NOT permitted for preliminary proposals.

Preliminary proposals are reviewed by carefully selected reviewers and NSF staff. Submission of a formal proposal is encouraged or discouraged based upon the reviewers' perceptions of likelihood that a proposal, based on the ideas presented, can be successful in the formal merit review process. *This is an advisory opinion and formal proposals may be submitted in either event.* The written response provides information to the proposer to strengthen the proposal. Reviews are returned as expeditiously as possible, but no later than one month prior to the date for submission of a full proposal.

Full Proposal:

Proposals submitted in response to this program announcement/solicitation should be prepared and submitted in accordance with the general guidelines contained in the NSF *Grant Proposal Guide* (GPG). The complete text of the GPG is available electronically on the NSF Web Site at: http://www.nsf.gov/cgi-bin/getpub?gpg. Paper copies of the GPG may be obtained from the NSF Publications Clearinghouse, telephone (301) 947-2722 or by e-mail from pubs@nsf.gov.

Full proposals must be submitted via FastLane no later than 5:00 PM local time on the specified deadline date. Submission of full proposals via FastLane requires completion of the following FastLane forms:

Cover Sheet. (See GPG, Chapter II, Section C) The Cover Sheet must contain all requested information. If project funds are requested from another Federal agency or another NSF program, it must be indicated on the cover sheet. If such funds are requested subsequent to proposal submission, a letter should be sent to the relevant program in ESIE, identifying the proposal by its NSF number. Proposers are reminded to identify the Program Solicitation number in the Program Solicitation block. Compliance with this requirement is critical to determining the relevant proposal processing guidelines. Failure to submit this information may delay processing. The related preliminary proposal number should be entered, when appropriate.

The Authorized Organizational Representative (AOR) must electronically sign the proposal Cover Sheet to submit the required proposal certifications. The AOR must provide the required certifications within five working days following the electronic submission of the proposal. Further instructions regarding this process are available on the FastLane Web Site at: http://www.fastlane.nsf.gov.

Project Summary.   A one-page (250 word) Project Summary should be prepared, suitable for publication, which presents a self-contained description of the activity that would result if the proposal were funded. The initial sentences should describe the IMD program component to which the proposal is submitted, the disciplinary content of the project, the grade level of the target audience, and the pedagogical strategies to be used. This information is used to place the proposal in the appropriate review panel. The summary should be written in the third person, in the present tense, and include an indication of the need being addressed, a statement of objectives, methods to be employed, potential contribution to the advancement of knowledge, and a description of the products or outcomes resulting from the project. The summary should be informative to other persons interested in developing projects or using instructional materials.

Table of Contents. (See GPG, Chapter II, Section C.2) The *Table of Contents* is automatically generated in FastLane.

Project Description (including results from prior NSF support and data sheet). (See GPG, Chapter II, Section C.3) The Project Description presents most of the information that determines whether or not a grant will be awarded. It should be written to respond to criteria provided in the section on each component. Reviewers will use this information in judging the merit of the proposal as described in this document. In addition, it should communicate potential project impact and general project characteristics. The information provided should help to direct proposals to appropriate reviewers. The maximum number of pages allowable for the *Project Description* is 15 pages, with the following exceptions: planning and conference grant proposals should be no longer than 10 pages in length, including visual materials (e.g., charts, graphs, maps, photographs, and other pictorial presentations); proposals for comprehensive, multi-year curricular materials should be no longer than 20 pages in length. Page formats should be single-spaced with a clear and legible type size of no smaller than 12-point type and with no less than 2.5 cm margins on all sides. See the section *Supplementary Documents* below, and individual program sections for any exceptions to this limitation.

Results from Prior Support. (See GPG, Chapter II, Section C.3) If the prospective PI or co-PI(s) received support for related NSF activities within the past five years, a description of the project(s) *and* outcomes must be provided in sufficient detail to enable reviewers to assess the value of results achieved. Past projects should be identified by NSF award number, funding amount, period of support, title, summary of results, and a list of publications and formal presentations that acknowledge the NSF award (do not submit copies of the latter). Evaluation data should be clearly described. Details regarding evaluation data should be put into an appendix. PIs must have submitted a final report for any completed NSF-funded project, or no new grant may be awarded.

Project data sheets: A completed project data sheet must accompany the proposal. Data sheets may be downloaded from the ESIE Web Site at: http://www.ehr.nsf.gov/ehr/esie/datasheet.doc. Data sheets should be included in the supplementary document section of FastLane.

References Cited. (See GPG, Chapter II, Section C.4) Any literature cited should be specifically related to the proposed project, and the *Project Description* should make clear how each reference has played a role in the motivation for or design of the project.

Supplementary Documents. (See GPG, Chapter II, Section C.9) Reviewers are often asked to read and assess a substantial number of competing proposals. For this reason, the *Project Description* alone should provide sufficient information so that a reviewer unfamiliar with the context of the project can make an informed judgment. It may be critical to convey more detailed information to demonstrate levels of competence or expertise, to document commitment of personnel or other resources, to demonstrate the quality of instructional materials, or to provide details of the evaluation of previously developed materials. Such material can be included in appendices that are clearly referenced in the proposal. Appendices, except sample materials, should be uploaded into the *Supplementary Documents* section on FastLane. Additionally, the proposal may refer to Web Sites that contain this type of supplementary material. Presentation of such materials should be thoughtful and concise. Reviewers are not required to read appendices.

Proposals for the development of student materials should include examples of the proposed materials and samples of past work, if they exist. These sample materials should be sent directly to the program, clearly labeled with the proposal number. If the materials are to be sent to the reviewers, at least ten copies are needed. Prospective PIs are encouraged to contact NSF Program Officers if they have questions about submission of appendix materials.

Biographical Sketches. (See GPG. Chapter II, Section C.5) Biographical information (no more than two pages) must be provided for each person listed as senior personnel on the budget form; include career and academic credentials and a mailing address.

Current and Pending Support. (See GPG, Chapter II, Section C.7).

Budgetary Information. (See GPG, Chapter II Section C.6) Proposals must contain a budget for each year of requested support. The proposal may request funds under any budget category so long as the item is considered necessary to perform the proposed work and is not precluded by program guidelines or applicable cost principles. All budget requests must be documented and justified in the Budget Justification section of no more than three pages. Ordinarily, no funds are made available for equipment or facilities or for continued operational expenses. Estimates of calendar months of activity must be reported for categories of key personnel.

Special Proposals:

·   **Small Grants for Exploratory Research (SGER).** (See GPG, Chapter II, Section C.11a) SGER grants are for small-scale exploratory, high-risk research. Investigators are strongly encouraged to contact an NSF Program Officer before submitting the proposal.

·   **Collaborative Proposals.** (See GPG Chapter 11, Section C.11b) Proposals in which investigators from more than one institution wish to collaborate on a unified project.

·   **Proposals for Conferences, Symposia and Workshops.** (See GPG, Chapter 11, Section C.11f) IMD may support a few well-focused conferences or workshops whose products inform the community.

Proposers are reminded to identify the program solicitation number (NSF-02-067) in the program announcement/solicitation block on the proposal Cover Sheet. Compliance with this requirement is critical to determining the relevant proposal processing guidelines. Failure to submit this information may delay processing.

B. Budgetary Information

Cost-sharing of 30% of the requested total amount of NSF funds is required for revision of published materials for proposals submitted for **Instructional Materials for Students** (**Section II.A**). No cost-sharing is specified for other programs in this solicitation. The nature (e.g., in-kind, financial) and use of cost-shared resources must be discussed in the budget justification in enough detail to allow NSF to determine its impact on the proposed project.

The proposed cost sharing must be shown on Line M on the proposal budget. Documentation of the availability of cost sharing must be included in the proposal. Only items which would be allowable under the applicable cost principles, if charged to the project, may be included as the awardee's contribution to cost sharing. Contributions may be made from any non-Federal source, including non-Federal grants or contracts, and may be cash or in-kind (see OMB Circular A-110, Section 23). It should be noted that contributions counted as cost-sharing toward projects of another Federal agency may not be counted towards meeting the specific cost-sharing requirements of the NSF award. All cost-sharing amounts are subject to audit. Failure to provide the level of cost-sharing reflected in the approved award budget may result in termination of the NSF award, disallowance of award costs and/or refund of award funds to NSF.

Other Budgetary Limitations: The majority of IMD project costs support personnel time and personnel-related costs. Modest requests to support acquisition of materials, supplies, equipment, and computing services are allowable. Grantees are expected to have the computing facilities, most of the equipment, and the physical environment to achieve project goals. IMD will not fund the purchase of classroom equipment necessary to pilot, field-test, or implement instructional materials. IMD does not support the publication of student instructional materials for distribution.

C. Deadline/Target Dates

Proposals must be submitted by the following date(s):

Preliminary Proposals (*required*): May 1, 2002
Full Proposals *by 5:00 PM local time***:**

 August 26, 2002 by 5:00 pm Local Time.

D. FastLane Requirements

Proposers are required to prepare and submit all proposals for this Program Solicitation through the FastLane system. Detailed instructions for proposal preparation and submission via FastLane are available at: http://www.fastlane.nsf.gov/a1/newstan.htm. For FastLane user support, call 1-800-673-6188 or e-mail fastlane@nsf.gov.

Submission of Electronically Signed Cover Sheets. The Authorized Organizational Representative (AOR) must electronically sign the proposal Cover Sheet to submit the required proposal certifications (see Chapter II, Section C of the Grant Proposal Guide for a listing of the certifications). The AOR must provide the required certifications within five working days following the electronic submission of the proposal. Further instructions regarding this process are available on the FastLane website at: http://www.fastlane.nsf.gov.

VI. PROPOSAL REVIEW INFORMATION

A. NSF Proposal Review Process

Reviews of proposals submitted to NSF are solicited from peers with expertise in the substantive area of the proposed research or education project. These reviewers are selected by Program Officers charged with the oversight of the review process. NSF invites the proposer to suggest, at the time of submission, the names of appropriate or inappropriate reviewers. Care is taken to ensure that reviewers have no conflicts with the proposer. Special efforts are made to recruit reviewers from non-academic institutions, minority-serving institutions, or adjacent disciplines to that principally addressed in the proposal.

The two merit review criteria are listed below. The criteria include considerations that help define them. These considerations are suggestions and not all will apply to any given proposal. While proposers must address both merit review criteria, reviewers will be asked to address only those considerations that are relevant to the proposal being considered and for which he/she is qualified to make judgements.

> **What is the intellectual merit of the proposed activity?**
> How important is the proposed activity to advancing knowledge and understanding within its own field or across different fields? How well qualified is the proposer (individual or team) to conduct the project? (If appropriate, the reviewer will comment on the quality of the prior work.) To what extent does the proposed activity suggest and explore creative and original concepts? How well conceived and organized is the proposed activity? Is there sufficient access to resources?

What are the broader impacts of the proposed activity?
How well does the activity advance discovery and understanding while promoting teaching, training, and learning? How well does the proposed activity broaden the participation of underrepresented groups (e.g., gender, ethnicity, disability, geographic, etc.)? To what extent will it enhance the infrastructure for research and education, such as facilities, instrumentation, networks, and partnerships? Will the results be disseminated broadly to enhance scientific and technological understanding? What may be the benefits of the proposed activity to society?

NSF staff will give careful consideration to the following in making funding decisions:

Integration of Research and Education
One of the principal strategies in support of NSF's goals is to foster integration of research and education through the programs, projects, and activities it supports at academic and research institutions. These institutions provide abundant opportunities where individuals may concurrently assume responsibilities as researchers, educators, and students and where all can engage in joint efforts that infuse education with the excitement of discovery and enrich research through the diversity of learning perspectives.

Integrating Diversity into NSF Programs, Projects, and Activities
Broadening opportunities and enabling the participation of all citizens -- women and men, underrepresented minorities, and persons with disabilities -- is essential to the health and vitality of science and engineering. NSF is committed to this principle of diversity and deems it central to the programs, projects, and activities it considers and supports.

Additional Review Criteria

In addition to the Foundation-wide criteria described in Chapter III of the GPG, specific criteria used in evaluating instructional materials, assessment, and research proposals include:

Impact. The potential for the project to make a significant impact in addressing a major national or regional problem. Potential of the project for significantly strengthening the literacy in STM. Use of a particularly creative approach that might serve as a model for others.

Plan. Likelihood that the project will achieve results, is cost-effective, and is appropriate relative to needs and anticipated impact. The soundness of the approach with respect to disciplinary content and/or instructional methods. Alignment or integration of the project with other major efforts to improve the quality of science, mathematics, or technology education. Clearly stated goals and criteria by which to judge their achievement. Reasonableness of evaluation plans. Credibility of the plan for project continuation beyond NSF support. Reasonableness of mechanisms put in place to ensure widespread dissemination of instructional materials, models, or other project results.

Personnel. The expertise and background of senior personnel to achieve success with the project. Assurances that their levels of commitment and involvement are commensurate with the anticipated contribution.

Products. Clear description of expected products or outputs of the project and the likelihood that they will be of high quality. Likelihood that the impact of the project will be broadened through dissemination or replication of products or outcomes in other locations or nationally.

Cooperative Relationships. Reasonableness of working relationships among collaborating parties and clear evidence of the level of collaboration demonstrated in the preparing the proposal. Likelihood that the project will facilitate greater interactions among professionals in museums, media, cooperating school systems, universities, and industry. Evidence that long-term relationships are likely to be forged that can supplement and support the quality of science, mathematics, and technology education.

Evaluation Plans. Inclusion of appropriate evaluation plans to assure that: (a) draft material and prototype activities will be tested during the development stages of the project, and (b) assessment will be conducted on the impact of the completed project on participants' knowledge, attitudes, interests, and/or behavior.

Contributions. Evidence that the proposal includes appropriate contributions (intellectual and/or financial) from the host institution, private sector, state or local educational agencies, colleges and universities, professional societies, and other sources.

Specific additional criteria used in evaluating Dissemination and Implementation proposals include:

Institutional Capacity. What involvement has the proposing institution and its partners had in significant, high quality curriculum dissemination and implementation? What is the experience in working with schools and school districts around standards-based reform? What is the expertise of key staff proposed for this project?

Project Design. Does the project design take into account all the stages involved in dissemination and implementation of research-based curricula?

Impact. What is the likelihood that that the project can increase the use of research-based materials, both in selected sites and in the nation?

Collaborative Relationships. Are the working relationships among collaborating parties strong?

Research. How will the project identify gaps in the research base? What are the plans to address them? Will the research findings be disseminated in a comprehensive way? Will the research address issues of equity and diversity in curriculum implementation?

Evaluation. Are the goals of the project clearly stated and measurable? Will the evaluation plan provide data on the impact of the project?

A summary rating and accompanying narrative will be completed and submitted by each reviewer. In all cases, reviews are treated as confidential documents. Verbatim copies of reviews, excluding the identities of reviewers, are sent to the Principal Investigator/Project Director by the Program Director. In addition, the proposer will receive an explanation of the decision to award or decline funding.

B. Review Protocol and Associated Customer Service Standard

All proposals are carefully reviewed by at least three other persons outside NSF who are experts in the particular field represented by the proposal. Proposals submitted in response to this announcement/solicitation will be reviewed by Panel Review.

Reviewers will be asked to formulate a recommendation to either support or decline each proposal. The Program Officer assigned to manage the proposal's review will consider the advice of reviewers and will formulate a recommendation.

In most cases, proposers will be contacted by the Program Officer after his or her recommendation to award or decline funding has been approved by the Division Director. This informal notification is not a guarantee of an eventual award.

NSF is striving to be able to tell applicants whether their proposals have been declined or recommended for funding within six months. The time interval begins on the closing date of an announcement/solicitation or the date of proposal receipt (whichever is later). The interval ends when the Division Director accepts the Program Officer's recommendation.

In all cases, after programmatic approval has been obtained, the proposals recommended for funding will be forwarded to the Division of Grants and Agreements for review of business, financial, and policy implications and the processing and issuance of a grant or other agreement. Proposers are cautioned that only a Grants and Agreements Officer may make commitments, obligations or awards on behalf of NSF or authorize the expenditure of funds. No commitment on the part of NSF should be inferred from technical or budgetary discussions with a NSF Program Officer. A Principal Investigator or organization that makes financial or personnel commitments in the absence of a grant or cooperative agreement signed by the NSF Grants and Agreements Officer does so at one's own risk.

VII. AWARD ADMINISTRATION INFORMATION

A. Notification of the Award

Notification of the award is made to *the submitting organization* by a Grants Officer in the Division of Grants and Agreements. Organizations whose proposals are declined will be advised as promptly as possible by the cognizant NSF Program Division administering the program. Verbatim copies of reviews, not including the identity of the reviewer, will be provided automatically to the Principal Investigator. (See section VI.A. for additional information on the review process.)

B. Award Conditions

An NSF award consists of: (1) the award letter, which includes any special provisions applicable to the award and any numbered amendments thereto; (2) the budget, which indicates the amounts, by categories of expense, on which NSF has based its support (or otherwise communicates any specific approvals or disapprovals of proposed expenditures); (3) the proposal referenced in the award letter; (4) the applicable award conditions, such as Grant General Conditions (NSF-GC-1)* or Federal Demonstration Partnership (FDP) Terms and Conditions;* and (5) any announcement or other NSF issuance that may be incorporated by reference in the award letter. Cooperative agreement awards also are administered in accordance with NSF Cooperative Agreement Terms and Conditions (CA-1). Electronic mail notification is the preferred way to transmit NSF awards to organizations that have electronic mail capabilities and have requested such notification from the Division of Grants and Agreements.

*These documents may be accessed electronically on NSF's Web site at http://www.nsf.gov/home/grants/grants_gac.htm. Paper copies may be obtained from the NSF Publications Clearinghouse, telephone (301) 947-2722 or by e-mail from pubs@nsf.gov.

More comprehensive information on NSF Award Conditions is contained in the NSF *Grant Policy Manual* (GPM) Chapter II, available electronically on the NSF Web site at http://www.nsf.gov/cgi-bin/getpub?gpm. The GPM is also for sale through the Superintendent of Documents, Government Printing Office (GPO), Washington, DC 20402. The telephone number at GPO for subscription information is (202) 512-1800. The GPM may be ordered through the GPO Web site at http://www.gpo.gov.

C. Reporting Requirements

For all multi-year grants (including both standard and continuing grants), the PI must submit an annual project report to the cognizant Program Officer at least 90 days before the end of the current budget period.

In addition to the standard reporting requirements, PIs will be required to submit regular information regarding the status of their projects. This will include information about participants, activities undertaken, and project outcomes.

Annual Reports. Annual reports should highlight major accomplishments, describe the lessons learned, document alignment with the proposed time line, and describe the status of the development of the materials. Samples of completed materials, or drafts of materials, should be included.

Site Visitor. The project and the NSF Program Officer may agree on a site visitor who reviews the progress of the project and its evaluation annually and reports to both the Principal Investigator and to the NSF Program Officer.

Final reports/materials submission. Within 90 days after the expiration of an award, the PI is also required to submit a final project report. Approximately 30 days before expiration, NSF will send a notice to remind the PI of the requirement to file the final project report. Two complete sets of materials must be submitted to IMD at the time of the submission of the final report. If materials are not in the final, published form when the final report is submitted, two published copies must be submitted to IMD as soon as they become available. One published copy must also be submitted to the Eisenhower National Clearinghouse (ENC). At any time, IMD staff may request interim drafts of materials for review.

Within 90 days after the expiration of an award, the PI also is required to submit a final project report. Approximately 30 days before expiration, NSF will send a notice to remind the PI of the requirement to file the final project report. Failure to provide final technical reports delays NSF review and processing of pending proposals for that PI. PIs should examine the formats of the required reports in advance to assure availability of required data.

NSF has implemented an electronic project reporting system, available through FastLane. This system permits electronic submission and updating of project reports, including information on project participants (individual and organizational), activities and findings, publications, and other specific products and contributions. PIs will not be required to re-enter information previously provided, either with a proposal or in earlier updates using the electronic system.

VIII. CONTACTS FOR ADDITIONAL INFORMATION

General inquiries regarding Instructional Materials Development should be made to:

For more information about IMD programs, please contact the following people in the Division of Elementary, Secondary, and Informal Education, telephone: (703) 292-8614 .

- Dr. John Bradley, Instructional Materials for Students [Mathematics], Dissemination and Implementation Sites [Mathematics], e-mail: jbradley@nsf.gov.

- Dr. Gerhard Salinger, Instructional Materials for Students [Physical Sciences and Technology Education], e-mail: gsalinge@nsf.gov.

- Dr. David Campbell, Instructional Materials for Students [Life and Earth Sciences], e-mail: dcampbel@nsf.gov.

- Dr. Janice Earle, Dissemination and Implementation Sites [Science], Assessment, and Applied Research, e-mail: jearle@nsf.gov.

For questions related to the use of FastLane, contact:

- ESIE FastLane contact, telephone: (703) 292.8620, e-mail: ehr-esi-info@nsf.gov.

IX. OTHER PROGRAMS OF INTEREST

The NSF *Guide to Programs* is a compilation of funding for research and education in science, mathematics, and engineering. The NSF *Guide to Programs* is available electronically at http://www.nsf.gov/cgi-bin/getpub?gp. General descriptions of NSF programs, research areas, and eligibility information for proposal submission are provided in each chapter.

Many NSF programs offer announcements or solicitations concerning specific proposal requirements. To obtain additional information about these requirements, contact the appropriate NSF program offices. Any changes in NSF's fiscal year programs occurring after press time for the *Guide to Programs* will be announced in the NSF E-Bulletin, which is updated daily on the NSF web site at http://www.nsf.gov/home/ebulletin, and in individual program announcements/solicitations. Subscribers can also sign up for NSF's Custom News Service (http://www.nsf.gov/home/cns/start.htm) to be notified of new funding opportunities that become available.

Teacher Enhancement Program - (*Elementary, Secondary, and Informal Education Program Solicitation and Guidelines* [NSF 01-61]http://www.nsf.gov/cgi-bin/getpub?nsf0160).

Informal Science Education - (*Elementary, Secondary, and Informal Education Program Solicitation and Guidelines* [NSF 01-61]http://www.nsf.gov/cgi-bin/getpub?nsf0160).

Presidential Awards for Excellence in Mathematics and Science Teaching (http://www.ehr.nsf.gov/pres_awards/)

Advanced Technological Education (ATE) – (*Advanced Technological Education (ATE) Program Solicitation* [NSF 02-035] http://www.nsf.gov/cgi-bin/getpub?nsf02035).**

Centers for Learning & Teaching (CLT) – (*Centers for Learning and Teaching (CLT)* [NSF 02-038] http://www.nsf.gov/cgi-bin/getpub?nsf02038).

Programs in other EHR Divisions that may be of interest to proposers to IMD include:

Assessment of Student Achievement in Undergraduate Education (ASA) – development and dissemination of assessments and practices to guide efforts to improve effectiveness of undergraduate science, technology, engineering, and mathematics (STEM) courses. (http://www.ehr.nsf.gov/EHR/DUE/programs/asa/)

Course Curriculum and Laboratory Improvement (CCLI) - instructional materials, courses for undergraduates, and professional development for faculty. (http://www.ehr.nsf.gov/EHR/DUE/programs/ccli/)

Graduate Teaching Fellows in K-12 Education (GK-12) - opportunities for graduate and upper division undergraduate students in STEM disciplines to work with mentor teachers in the nation's K-12 schools. (http://www.ehr.nsf.gov/dge/program/gk12)

Interagency Education Research Initiative (IERI) - Supports the establishment of a strong research base for education and learning, particularly in investigating scaling-up of proven interventions and the role of instructional technologies. IERI is a joint research activity between the NSF, the National Institute of Child Health and Development of NIH, and the Department of Education. (http://www.nsf.gov/cgi-bin/getpub?nsf0192)

Math and Science Partnership (MSP) – more information about this new grant program can be found at http://www.ehr.nsf.gov/

National Science, Mathematics, Engineering, and Technology Education Digital Library (NSDL) - online networks of learning environments and resources for STEM education at all levels. (http://www.ehr.nsf.gov/EHR/DUE/programs/nsdl/)

Research on Learning and Education (ROLE) - research in four areas: (1) Brain research as a foundation for research on human learning; (2) Fundamental research on behavioral, cognitive, affective, and social aspects of human learning; (3) Research on STEM learning in formal and informal educational settings; and (4) Research on STEM learning in complex educational systems. (http://www.ehr.nsf.gov/EHR/REC/)

Science, Technology, Engineering, and Mathematics Teacher Preparation (STEMTP) - development of exemplary science, technology, engineering, and mathematics teacher preparation models. (http://www.ehr.nsf.gov/EHR/DUE/programs/stemtp/)

ABOUT THE NATIONAL SCIENCE FOUNDATION

The National Science Foundation (NSF) funds research and education in most fields of science and engineering. Awardees are wholly responsible for conducting their project activities and preparing the results for publication. Thus, the Foundation does not assume responsibility for such findings or their interpretation.

NSF welcomes proposals from all qualified scientists, engineers and educators. The Foundation strongly encourages women, minorities and persons with disabilities to compete fully in its programs. In accordance with Federal statutes, regulations and NSF policies, no person on grounds of race, color, age, sex, national origin or disability shall be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving financial assistance from NSF (unless otherwise specified in the eligibility requirements for a particular program).

Facilitation Awards for Scientists and Engineers with Disabilities (FASED) provide funding for special assistance or equipment to enable persons with disabilities (investigators and other staff, including student research assistants) to work on NSF-supported projects. See the program announcement/solicitation for further information.

The National Science Foundation has Telephonic Device for the Deaf (TDD) and Federal Information Relay Service (FIRS) capabilities that enable individuals with hearing impairments to communicate with the Foundation about NSF programs, employment or general information. TDD may be accessed at (703) 292-5090, FIRS at 1-800-877-8339.

The National Science Foundation is committed to making all of the information we publish easy to understand. If you have a suggestion about how to improve the clarity of this document or other NSF-published materials, please contact us at plainlanguage@nsf.gov.

PRIVACY ACT AND PUBLIC BURDEN STATEMENTS

The information requested on proposal forms and project reports is solicited under the authority of the National Science Foundation Act of 1950, as amended. The information on proposal forms will be used in connection with the selection of qualified proposals; project reports submitted by awardees will be used for program evaluation and reporting within the Executive Branch and to Congress. The information requested may be disclosed to qualified reviewers and staff assistants as part of the proposal review process; to applicant institutions/grantees to provide or obtain data regarding the proposal review process, award decisions, or the administration of awards; to government contractors, experts, volunteers and researchers and educators as necessary to complete assigned work; to other government agencies needing information as part of the review process or in order to coordinate programs; and to another Federal agency, court or party in a court or Federal administrative proceeding if the government is a party. Information about Principal Investigators may be added to the Reviewer file and used to select potential candidates to serve as peer reviewers or advisory committee members. See Systems of Records, NSF-50, "Principal Investigator/Proposal File and Associated Records," 63 Federal Register 267 (January 5, 1998), and NSF-51, "Reviewer/Proposal File and Associated Records," 63 Federal Register 268 (January 5, 1998). Submission of the information is voluntary. Failure to provide full and complete information, however, may reduce the possibility of receiving an award.

Pursuant to 5 CFR 1320.5(b), an agency may not conduct or sponsor, and a person is not required to respond to an information collection unless it displays a valid OMB control number. The OMB control number for this collection is 3145-0058. Public reporting burden for this collection of information is estimated to average 120 hours per response, including the time for reviewing instructions. Send comments regarding this burden estimate and any other aspect of this collection of information, including suggestions for reducing this burden, to: Suzanne Plimpton, Reports Clearance Officer, Division of Administrative Services, National Science Foundation, Arlington, VA 22230, or to Office of Information and Regulatory Affairs of OMB, Attention: Desk Officer for National Science Foundation (3145-0058), 725 17th Street, N.W. Room 10235, Washington, D.C. 20503.

OMB control number: 3145-0058.